

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 22 NOV 2005

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Applicant's or agent's file reference BPCL 10017 cog		<b>FOR FURTHER ACTION</b> See Form PCT/PEA/416	
International application No. PCT/GB2004/002140	International filing date (day/month/year) 18.05.2004	Priority date (day/month/year) 05.06.2003	
International Patent Classification (IPC) or national classification and IPC C07C11/02, C07C5/48, B01J23/56, B01J23/92, B01J37/02			
Applicant INNOVENE EUROPE LIMITED et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  10.12.2004		Date of completion of this report  21.11.2005	
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  de Cauwer, R  Telephone No. +49 89 2399-7344 	

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ON PATENTABILITY**

International application No.  
PCT/GB2004/002140

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-11 as originally filed

**Claims, Numbers**

1-15 received on 05.04.2005 with letter of 29.03.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
- \* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15 does not involve an inventive step in the sense of Article 33(3) PCT.

- 2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 12, and discloses a metallic support catalyst in the form of a monolith.

The subject-matter of claim 12 therefore differs from D1 in that: the catalyst of the application relates to a metallic foam.

The problem to be solved by the present invention may therefore be regarded as how to improve the autothermal cracking process.

The solution proposed in claim 12 (a metallic foam catalyst) of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.

It is clear from the description (page 4, line 4-5, line 11-17) of the application that the monolithic support is the preferred support structure. It is therefore clear that D1 will solve the same problem, possibly even with better results since it is the preferred embodiment.

- 2.2 The document D3 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses a process for the production of an olefin, using a catalyst that may have a support in the form of a ceramic foam.

The subject-matter of claim 1 therefore differs from D1 in that: the catalyst of the application relates to a metallic structured packing support loaded with a non metallic coating.

The problem to be solved by the present invention may therefore be regarded as how to improve the autothermal cracking process.

The solution proposed in claim 1 (a metallic structured packing support loaded with a non metallic coating) of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.

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(SEPARATE SHEET)**

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The applicant has not shown any advantage or surprising effect directly relating to this differentiating feature. Thus no additional problem seems to have been solved by the presented solution that has not been solved yet by the prior art D3. Additionally a person skilled in the art would be aware of the existence of metallic structured packing supports loaded with a non metallic coating (see D1) and therefore it would not involve an inventive step to combine the teachings of D1 and D3.

3. The dependent claims do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

Case 10017(2)

## Claims:

1. A process for the production of an olefin, said process comprising passing a mixture of a hydrocarbon and an oxygen-containing gas over a catalyst capable of supporting combustion beyond the fuel rich limit of flammability, said catalyst comprising a catalytic component and a metallic support wherein the support is a metallic structured packing comprising a multiplicity of open-ended channels and which has been loaded with a non metallic coating.
2. A process as claimed in claim 1, wherein the catalyst component comprises a Group VIII metal.
3. A process as claimed in claim 1 or claim 2, wherein the metallic support is selected from FeCrAlY, NiCrAlY, CoCrAlY, Ni-Chrome, Inconel and Monel.
4. A process as claimed in any one of the preceding claims, wherein the metallic support is in the form of a foam having a pore size in the range of 10 pores per inch (ppi) to 100ppi.
5. A process as claimed in any one of claims 1 to 3, wherein the metallic support is in the form of a monolith having between 2000cpi (cells per inch) to 5cpi.
6. A process as claimed in any one of the preceding claims, wherein the metallic support comprises a series of blocks or layers that tessellate together to leave no gaps.
7. A process as claimed in any one of the preceding claims, wherein the non metallic coating is a ceramic material selected from alumina, silica-alumina, a combination of alumina and mullite, lithium aluminium silicate, cordierite, silicon carbide, zirconia toughened alumina, partially stabilized zirconia, fully stabilized zirconia, spinel, chromia, titania, aluminium titanate, or any combination of the above.

8. A process as claimed in any one of the preceding claims, wherein hydrogen is co-fed with the hydrocarbon and oxygen-containing gas to the reaction zone.
9. A process as claimed in any one of the preceding claims, wherein a non catalytic resistance zone is located upstream of the catalyst.
- 5 10. A process as claimed in any one of the preceding claims, wherein the ratio of hydrocarbon to oxygen-containing gas is 5 to 16, times the stoichiometric ratio of hydrocarbon to oxygen-containing gas required for complete combustion of the hydrocarbon to carbon dioxide and water.
11. A process as claimed in any one of the preceding claims, wherein the process is  
10 operated at a pressure of between 10-30 barg.
12. A catalyst capable of supporting combustion beyond the fuel rich limit of flammability, said catalyst comprising a catalytic component and a metallic support wherein the metallic support is a metallic structured packing comprising a multiplicity of open-ended channels, and which has been loaded with a non metallic coating, and  
15 further wherein the metallic support is in the form of a foam.
13. A catalyst as claimed in claim 12, wherein the non-metallic coating has been loaded onto the support by any one of the following methods; aluminizing, chemical vapour deposition, sputter coating and washcoating.
14. A catalyst as claimed in claim 13, wherein washcoating is used to provide the non-  
20 metallic coating on the metallic support.
15. A catalyst as claimed in any one of claims 12 to 14 wherein the foam has a pore size in the range of 10 pores per inch (ppi) to 100ppi.